

## Claims

What is claimed is:

1. A thermal dissipation assembly comprising:

a thermoelectric assembly configured to couple to a surface of a heat generating component, said heat generating component having a non-uniform thermal distribution across said surface thereof between at least one first region of said surface and at least one second region of said surface, wherein said at least one first region has higher heat flux than said at least one second region; and

wherein said thermoelectric assembly includes at least one first area of thermoelectric elements and at least one second area of thermoelectric elements, said at least one first area of thermoelectric elements being configured for at least partial alignment to said at least one first region of higher heat flux when said thermoelectric assembly is coupled to said surface of said heat generating component, and said at least one second area of thermoelectric elements being configured for at least partial alignment to said at least one second region of lower heat flux when said thermoelectric assembly is coupled to said surface of said heat generating component, and wherein said at least one first area of thermoelectric elements comprises a greater density of thermoelectric elements than said at least one second area of thermoelectric elements.

2. The thermal dissipation assembly of claim 1, wherein said at least one first area of thermoelectric elements comprises cross-sectionally smaller thermoelectric elements than said at least one second area of thermoelectric elements.

3. The thermal dissipation assembly of claim 1, wherein said at least one first area of thermoelectric elements comprises a first array of thermoelectric elements and said at least one second area of thermoelectric elements comprises a second array of thermoelectric elements, and wherein said first array of thermoelectric elements has a smaller pitch than said second array of thermoelectric elements.

4. The thermal dissipation assembly of claim 1, wherein said heat generating component comprises an integrated circuit chip, and wherein said at least one first region of higher heat flux comprises at least one processor region, and said at least one first area of thermoelectric elements aligns with said at least one processor region when said thermoelectric assembly is coupled to said surface of said integrated circuit chip.

5. The thermal dissipation assembly of claim 1, wherein said thermoelectric assembly further comprises a first support plate and a second support plate between which said at least one first area of thermoelectric elements and said at least one second area of thermoelectric elements are disposed, and wherein said thermoelectric assembly comprises a thin-film thermoelectric assembly.

6. The thermal dissipation assembly of claim 5, wherein said first support plate is configured to couple to said surface of said heat generating component, and said second support plate is configured to couple to at least one of a thermally conductive cap, a thermal spreader or a heat sink for facilitating removal of heat from said thermoelectric assembly.

7. A cooled electronic module comprising:

an electronic device having a non-uniform thermal distribution across a surface thereof between at least one first region of said surface and at least one second region of said surface, wherein said at least one first region has higher heat flux than said at least one second region; and

a thermoelectric assembly coupled to said surface of said electronic device, said thermoelectric assembly including at least one first area of thermoelectric elements and at least one second area of thermoelectric elements, said at least one first area of thermoelectric elements being aligned over said at least one first region of higher heat flux, and said at least one second area of thermoelectric elements being aligned over said at least one second region, wherein said at least one first area of thermoelectric elements comprises a greater density of thermoelectric elements than said at least one second area of thermoelectric elements.

8. The cooled electronic module of claim 7, wherein said at least one first area of thermoelectric elements comprises cross-sectionally smaller thermoelectric elements than said at least one second area of thermoelectric elements.

9. The cooled electronic module of claim 7, wherein said at least one first area of thermoelectric elements comprises a first array of thermoelectric elements and said at least one second area of thermoelectric elements comprises a second array of thermoelectric elements, and wherein said first array of thermoelectric elements has a smaller pitch than said second array of thermoelectric elements.

10. The cooled electronic module of claim 7, wherein said electronic device comprises an integrated circuit chip, and wherein said at least one first region of higher heat flux comprises at least one processor region, and said at least one first area of thermoelectric elements aligns with said at least one processor region.

11. The cooled electronic module of claim 7, wherein said thermoelectric assembly further comprises a first support plate and a second support plate between which said at least one first area of thermoelectric elements and said at least one second area of thermoelectric elements are disposed, and wherein said thermoelectric assembly comprises a thin-film thermoelectric assembly.

12. The cooled electronic module of claim 11, further comprising a housing surrounding said electronic device and said thermoelectric assembly, said housing sealing said electronic device and thermoelectric assembly from the ambient environment.

13. The cooled electronic module of claim 12, wherein said electronic module comprises a multichip module, said electronic device comprises multiple integrated circuit chips, and said thermoelectric assembly comprises multiple thermoelectric modules coupled to said multiple integrated chips, and wherein at least one thermoelectric module of said multiple thermoelectric modules comprises said first area of thermoelectric elements and said second area of thermoelectric elements.

14. The cooled electronic module of claim 12, wherein said first support plate is coupled to said surface of said electronic device, and said second support plate is coupled to at least one of a thermal spreader, a heat sink, or a thermally conductive cap of said housing for facilitating removal of heat from said thermoelectric assembly.

15. A method of fabricating a thermal dissipation assembly for an electronic device, said method comprising:

providing a thermoelectric assembly configured to couple to a surface of an electronic device, said electronic device having a non-uniform thermal distribution across said surface between at least one first region of said surface and at least one second region of said surface, wherein said at least one first region has a higher heat flux than said at least one second region; and

wherein said providing of the thermoelectric assembly includes providing at least one first area of thermoelectric elements and at least one second area of thermoelectric elements, said at least one first area of thermoelectric elements being configured for at least partial alignment to said at least one first region of higher heat flux when said thermoelectric assembly is coupled to said surface of said electronic device, and said at least one second area of thermoelectric elements being configured for at least partial alignment to said at least one second region when the thermoelectric assembly is coupled to said surface of said electronic device, and wherein said at least one first area of thermoelectric elements comprises a greater density of thermoelectric elements than said at least one second area of thermoelectric elements.

16. The method of claim 15, wherein said providing further comprises providing the at least one first area of thermoelectric elements to comprise cross-sectionally smaller thermoelectric elements than said at least one second area of thermoelectric elements.

17. The method of claim 15, wherein said providing further comprises providing said at least one first area of thermoelectric elements as a first array of thermoelectric elements and said at least one second area of thermoelectric elements as a second array of thermoelectric elements, wherein said first array of thermoelectric elements has a smaller pitch than said second array of thermoelectric elements.

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